REMARKS/ARGUMENTS

Reconsideration of this patent application is respectfully requested in view of the amendments to the claims, and the remarks presented herewith.

The Applicant comments upon the prior art rejection of the claims as follows.

The present invention is directed to a piston engine, in particular a reciprocating internal combustion engine, comprising a working space controlled by main valves, a charge channel leading to at least one of the main valves, a region of the charge channel divided into at least two parallel charge channel paths, and at least one additional valve controlling that portion of the charge volume flow in each of the two parallel charge channel paths wherein the additional valves are configured as rotary slide valves (4, 5, 9) and each of them, by itself, uninterruptedly rotates in exclusively one direction during machine operation, the volume flow of the main valves and additional valves (7; 4, 5, 9), on the one hand, as well as of the additional valves (4, 5, 9) among one another, on the other hand, are exclusively coordinated with one another by means of

varying the rotation of the rotary slide valves (4, 5, 9) relative to one another.

Morikawa (U.S. Patent No. 4,545,347), in column 1, lines 6 to 11, discloses an intake system for an internal combustion engine having primary and secondary intake systems each having a carburetor, in which the primary intake system operates for light load and the secondary intake system operates for heavy load.

Furthermore, *Morikawa* discloses in column 1, lines 48 to 68 and column 2, lines 1 to 10, that the object of *Morikawa* is to provide a system which may meet the above described requirements for swirl effect and provide optimum swirl effect dependent on operating conditions of an engine.

To this end, according to *Morikawa*, there is provided an intake system for an automotive engine having cylinders, primary intake ports communicated with the cylinders, and secondary intake ports communicated with the cylinders. Each of the primary and secondary intake ports is communicated with a corresponding cylinder at a common intake valve, and each primary intake port is disposed in a tangential direction so as to provide a swirl of induced mixture. A primary intake manifold communicated with the primary intake ports and a secondary intake

manifold communicated with the secondary intake ports are provided.

A primary carburetor having a throttle valve is provided in the primary intake manifold, and a secondary carburetor having a throttle valve is provided in the secondary intake manifold. The throttle valve of the secondary carburetor is so arranged to be opened after the throttle valve of the primary carburetor has been fully opened.

A control valve is provided in each branch of the secondary intake manifold for controlling a counter flow of the induced mixture. A vacuum operated actuator is provided for opening the control valve as engine speed increases. A sensor senses engine speed and load on the engine, and a control circuit responsive to the outputs of the sensor operates the actuator so as to open the control valve as engine speed and load increase.

Davis, U.S. Patent No. 5,105,784 in column 1, lines 6 to 9, discloses an induction control means for an internal combustion engine and particularly a rotary valve with independently controlled phase and duration.

Furthermore, *Davis* in column 2, lines 6 to 30, discloses a rotary valve for controlling the air flow to a cylinder of an internal combustion engine, said rotary valve comprising a stator passage leading to the cylinder for supplying air thereto, a rotor having a longitudinal axis, said rotor being mounted adjacent to the end of said stator passage which is opposite to the cylinder so that said axis is transverse to the end of said stator passage adjacent to said rotor, said rotor having a rotor passage, said rotor being adapted to rotate about said axis enabling periodic registration of said rotor passage with said stator passage, said registration constituting a valve opening, said rotor being further adapted for shifting along said axis to vary the orientation between said rotor and stator passages, said stator and rotor passages being shaped so that the duration of said valve opening varies with axial shifting of said rotor, means for axially shifting said rotor to control the duration of said valve opening; means for rotating said rotor in accordance with an intake stroke of the engine, said means for rotating including means for varying the phrase of said valve opening with respect to the intake stroke, said means for rotating thereby enabling coordination between the intake stroke and said valve opening.

The present invention does not consist, as the Office Action incorrectly assumes, of replacing additional valves configured as flap valves with rotary slide valves. As now explained in greater detail below, the rotary slide valves that are used as a replacement for flap valves, according to the present invention, are supposed to be operated in a very specific manner during machine operation, at least in a number of two, in flow channels that are guided parallel to one another and combine to form a single channel ahead of a subsequent main valve. Therefore these two prior art documents cited by the Patent Examiner do not anticipate the present invention.

In order to more precisely define the present invention, claim 1 was amended as follows to recite that:

- the additional valves are configured as rotary slide valves (4, 5, 9) and each of them, by itself, uninterruptedly rotates in exclusively one direction during machine operation,

- the volume flow of the main valves and additional valves (7; 4, 5, 9), on the one hand, as well as of the additional valves (4, 5, 9) among one another, on the other hand, are exclusively coordinated with one another by means of varying

the rotation of the rotary slide valves (4, 5, 9) relative to one another.

More particularly, the prior art U.S. Patent No. 4,545,347, to *Morikawa*, can be viewed as being the closest prior art. There, flap valves are provided in parallel feed channels that combine ahead of the main valve, to control the charging air feed. Fundamentally, control of the loading air is possible, using these flap valves, in the same manner as can be achieved with the device according to the invention. In the case of using such flap valves, which are oscillating drives, problems occur at high switching frequencies, resulting from the required delays and accelerations of the flaps, in each instance. Particularly in the case of internal combustion engines that run at high rpm's, these problems cannot be overcome at least without a great amount of effort in terms of apparatus, or at least not with sufficient operational reliability.

The invention is therefore concerned, in the case of a device according to *Morikawa* U.S. 4,545,347, for example, with solving the problem of finding valves that are technically better suitable, as compared with flap valves, for high switching frequencies. In this connection, the replacement valves should be

structured in simple manner, and it should be possible to operate them reliably for a long useful lifetime.

To achieve the device according to the invention, it is not sufficient to merely replace a flap valve that is present, in each instance, in charging channels that run parallel to one another, with a rotary slide valve. Aside from such a replacement, it is furthermore absolutely necessary to have the rotary slide valves rotate in a very specific manner, coordinated with one another, during machine operation. This is achieved in that the rotary slides that lie parallel rotate without interruption during machine operation, and are varied only in their rotary position relative to one another. In this connection, the rotary behavior [of the valves], which can be adjusted relative to one another, determines the dynamics and the amount of the volume stream that flows through the two valves and is fed to the main valve.

A person skilled in the art could not derive any suggestion in this direction from the *Davis* U.S. 5,105,784. This is because there, only a single rotary slide valve is used, in which the dynamics and the amount of the flow-through stream are not determined exclusively by means of a rotation, but also, additionally, by an axial displacement of the rotary slide rotor.

The axially required movement of the rotary slide rotor, in particular, requires a complicated configuration of the rotary slide valve, which has a tendency to fail. The rotary slides used for the solution according to the invention only have to perform rotation movements in order to change the dynamics and the flow-through amount of a volume stream, specifically such movements produced with rotational settings that are adjustable relative to one another, of at least two rotary slides disposed in parallel flow channels.

Proceeding from a device according to the *Morikawa U.S. 4,545,347*, a person skilled in the art could at most derive from the disclosure of the *Davis U.S. 5,105,784* the possibility of replacing the flap valves used in the document first mentioned with the rotary slide valves disclosed according to the *Davis U.S. 5,105,784*, with an axially displaceable rotor, in each instance. The recognition according to the invention, of not only replacing the flap valves according to the *Morikawa U.S. 4,545,347* with rotary slide valves according to *Davis U.S. 5,105,784*, but furthermore using simply structured, rotary slide valves, in other words ones having only rotating rotary slides, and achieving the different flow dynamics and flow-through amounts exclusively by means of rotation of these slide valves that is coordinated mutually between two displacement valves, is

the actual inventive achievement. This inventive achievement must be put into relation with the priority date of the present application, in other words a time when the result according to the invention did not yet exist. Because considered retrospectively, there is much that incorrectly appears obvious, specifically if a solution that is particularly simple and advantageous, in the end result, is shown for the first time for a problem that was actually known, but was previously solved in different and more complicated manner.

The other references cited by the Examiner with regard to the state of the art cannot lead to any different result, since they fundamentally do not show anything more than the documents already mentioned above. This is particularly true with regard to the rotary slide valve according to U.S. 4,802,452, in which the rotor of the rotary slide is configured to be exclusively rotational. The control of the dynamics as well as of the charging air amount for an internal combustion engine that is possible according to the invention cannot be achieved with such a rotary slide valve alone.

Enclosed is PTO Form 1449 upon which are listed an English translation of the International Search Report, and Abstracts in English of *JP 2,241,925, DE 3,737,820 and DE 19,830,575*. Because

these documents relate back to the originally filed Information Disclosure Statement, it is believed that no fee is required for the U.S.P.T.O. to consider all of these documents.

However, if a U.S.P.T.O. fee should be required, then the Commissioner of Patents and Trademarks is hereby authorized to charge any additionally required fee, or to credit any overpayments, to Deposit Account No. 03-2468.

For all these reasons, all the claims are patentable under 35 U.S.C. 103. A prompt notification of allowability is resepctfully requested.

Respectfully submitted,
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Enclosure: 1. PTO Form 1449
2. Copies of 3 Abstracts in English and International Search Report

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on November 9, 2005.

Maria Guastella